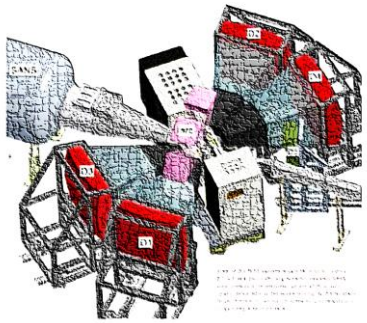

EUROPEAN SPALLATION SOURCE

4D Neutron Imaging on Textured Samples

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Beamtime	My Background

- PhD in physics from University of New South Wales (Australia)

- Postdoc in European Spallaton Source (ESS) on BEER diffraction beamline in cooperation between 15 EU country and Japan

- Worked in different countries and reactor/spallation sources (such as ANSTO –Australia, JPARC – Japan, HZB - Berlin, PSI - Switzerland, UJF - Czech Republic)

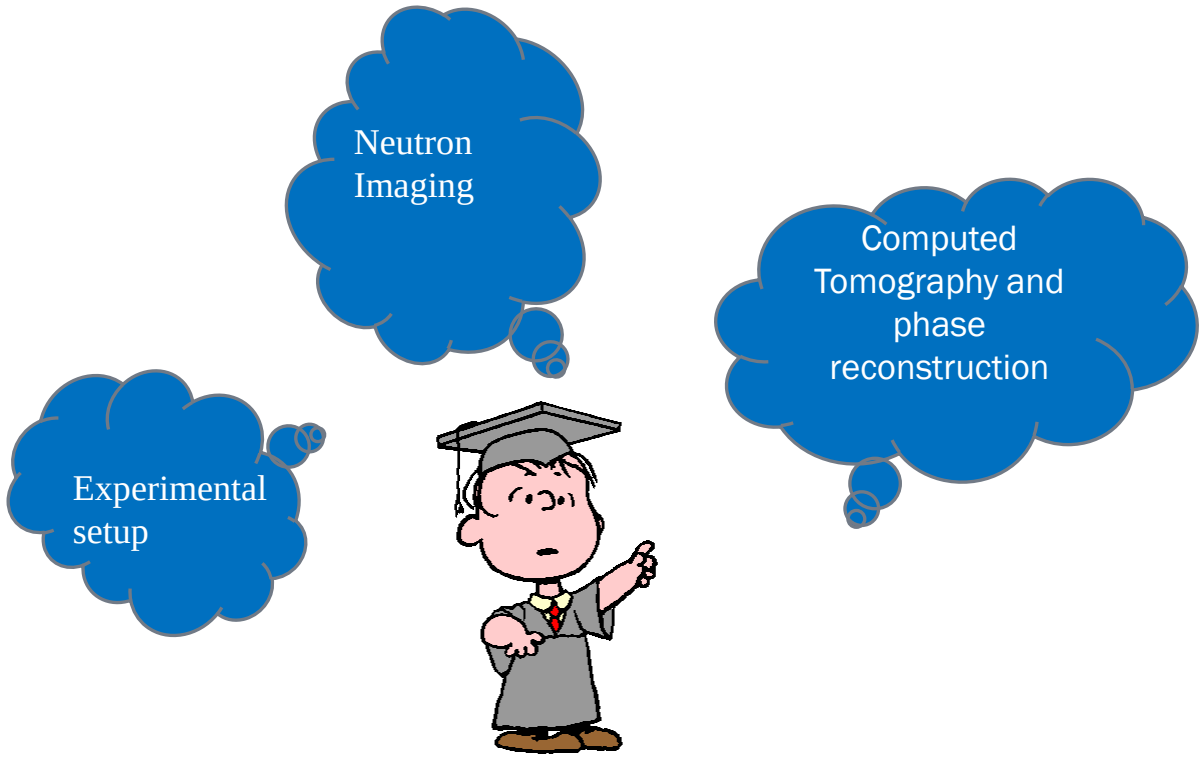
-Member in the national committee of crystallography (2023)

Beamtime	Data Processing Update

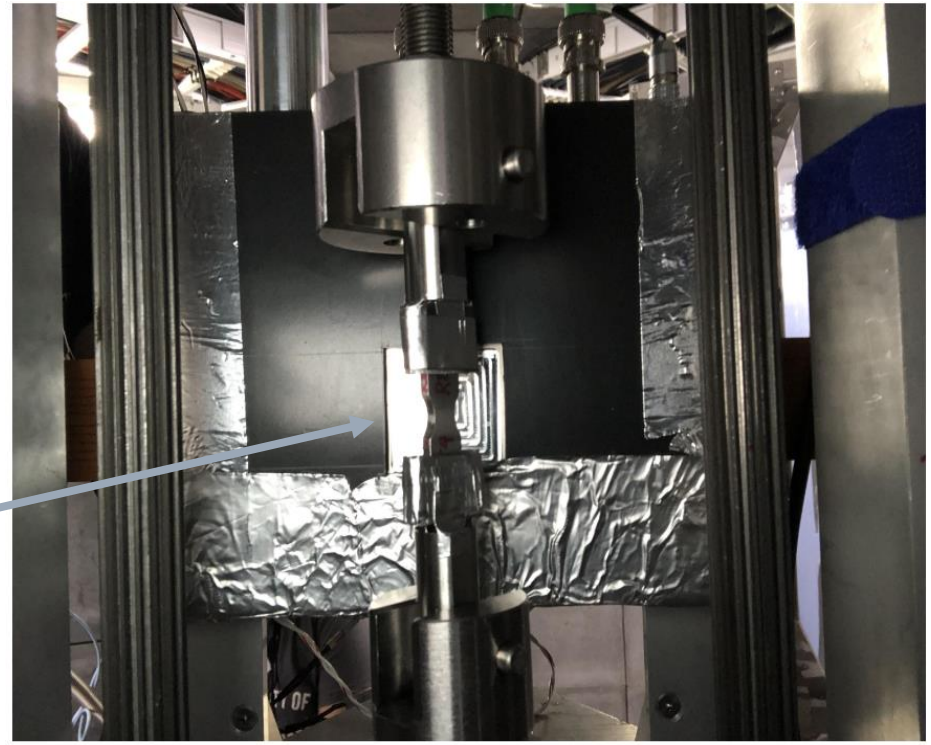
Some of the python codes used for the data analysis are found in

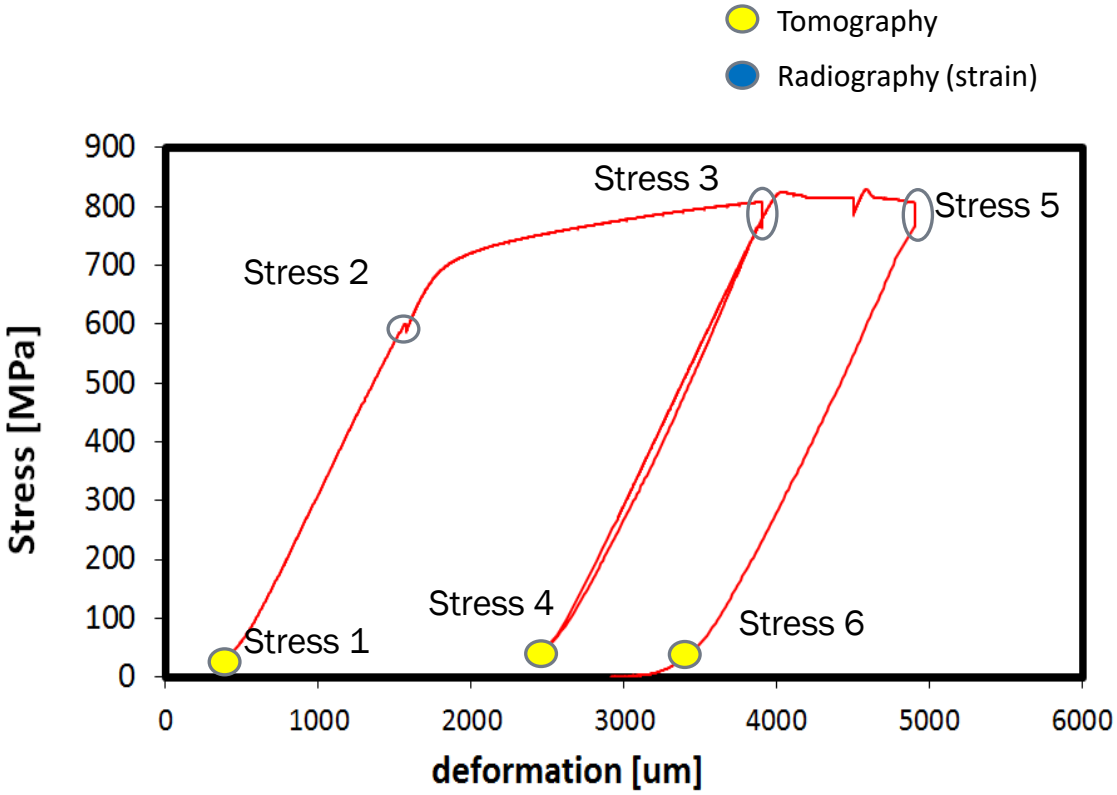
https://github.com/nancynaguib/imaging-python

Beamtime | Outline



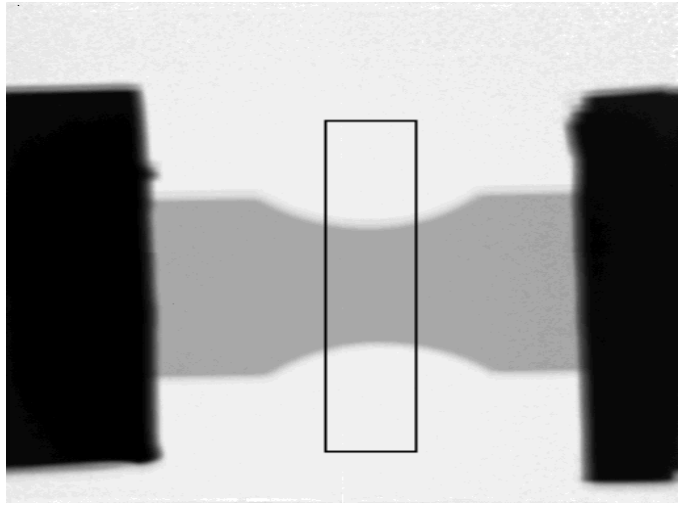
Beamtime | Experimental setup

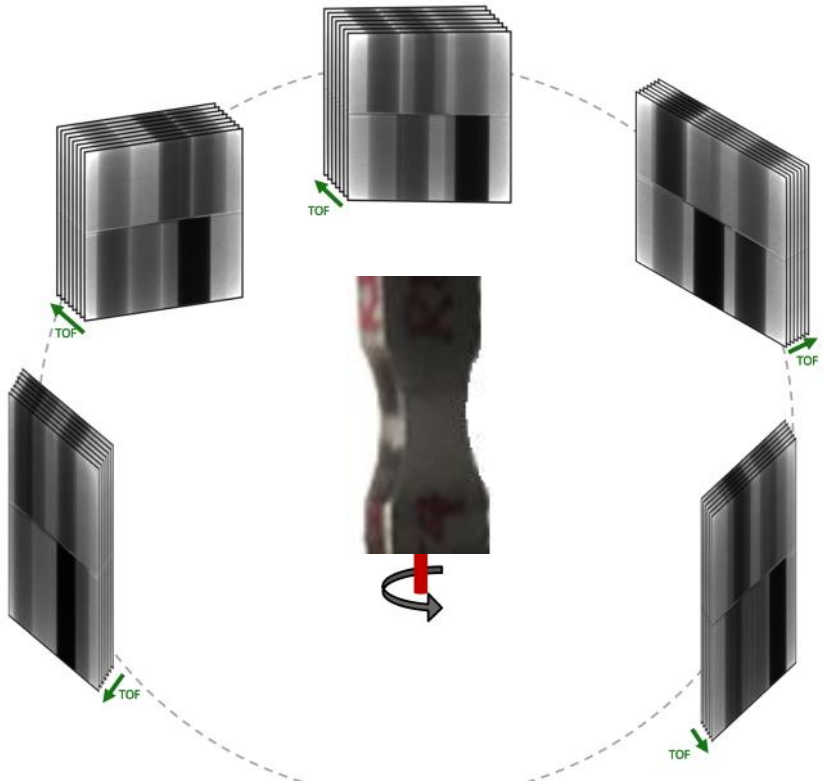




Beamtime | Experimental setup

- 46 projections over 360 degree for Stress 1 and Stress 6
- 25 min exposure time





Beamtime	Experimental setup

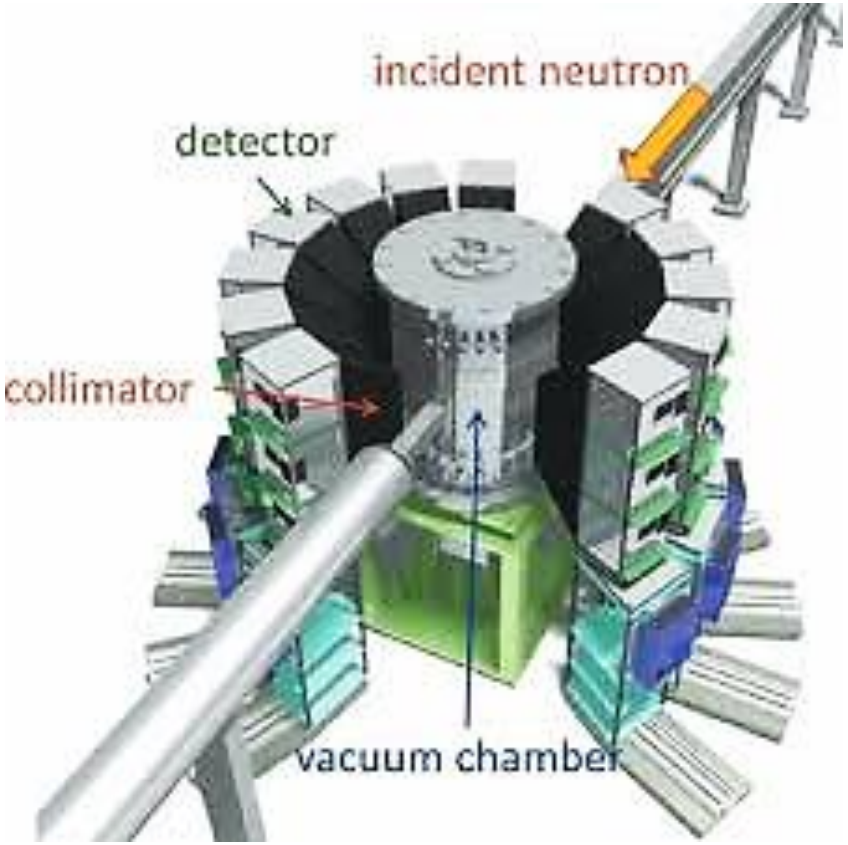
Flux:

1.3×10^6 n/s/mm^2

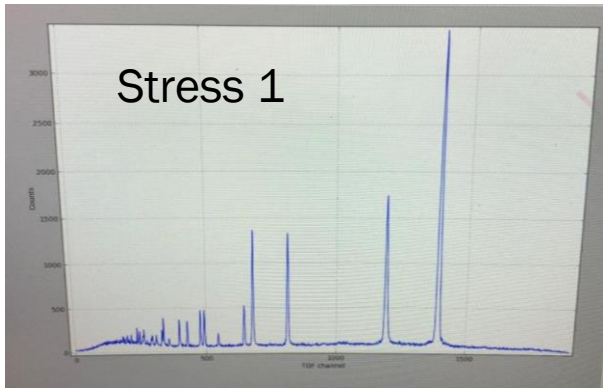
Wavelength: 0.4 - 4.4 Å

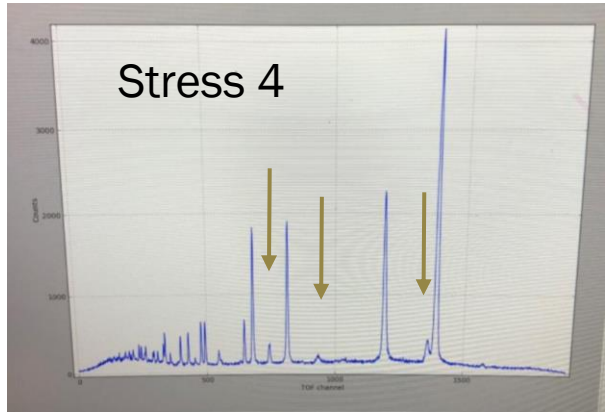
Spatial resolution: 55 µm

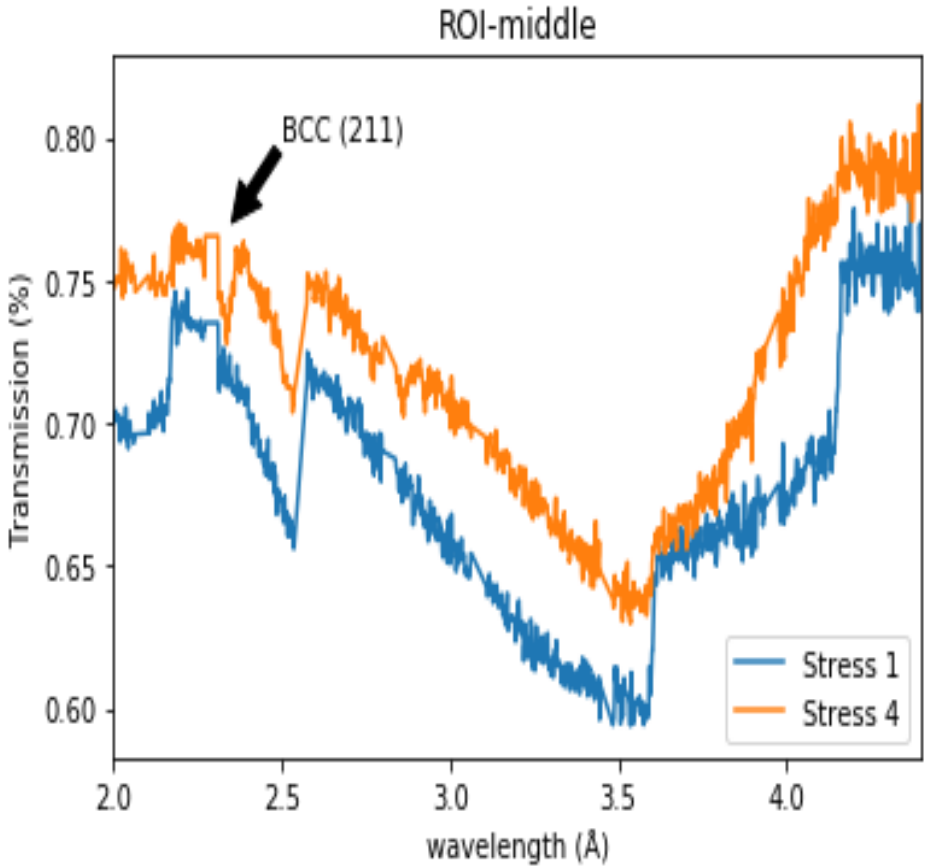
wavelength resolution: 0.2%

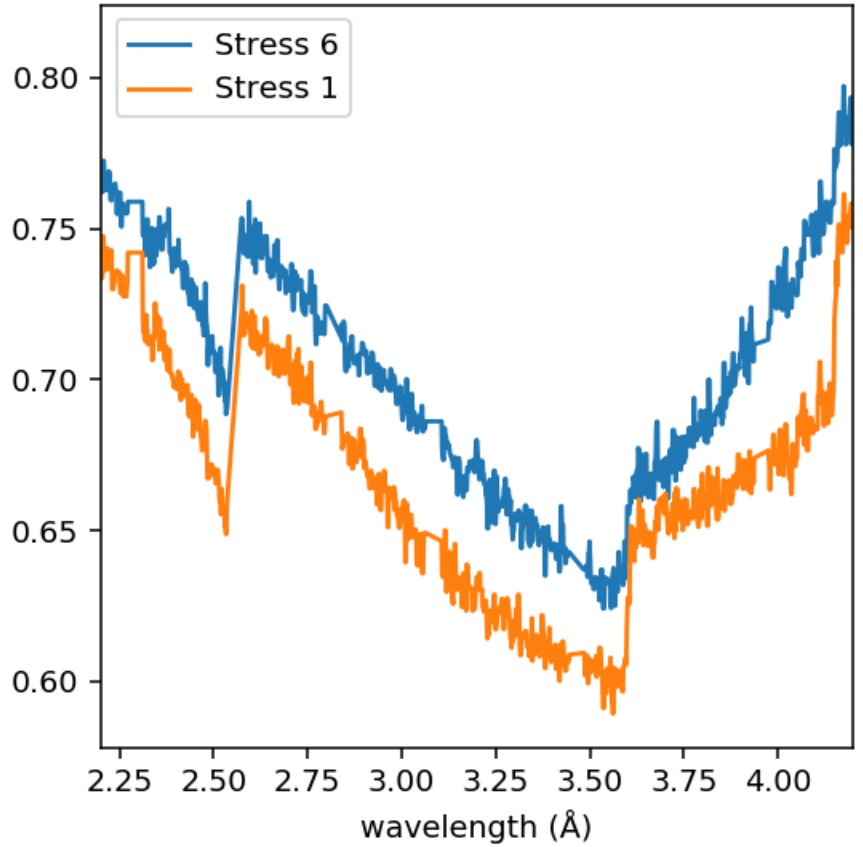


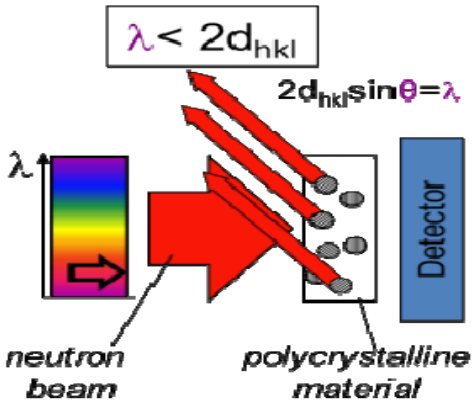
Beamtime | Experimental setup

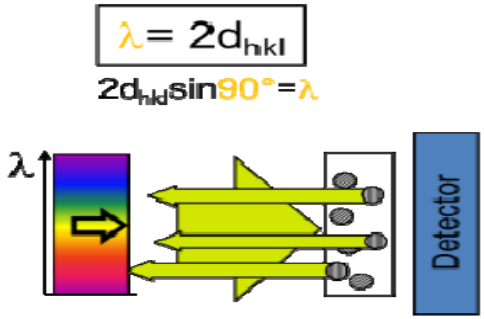


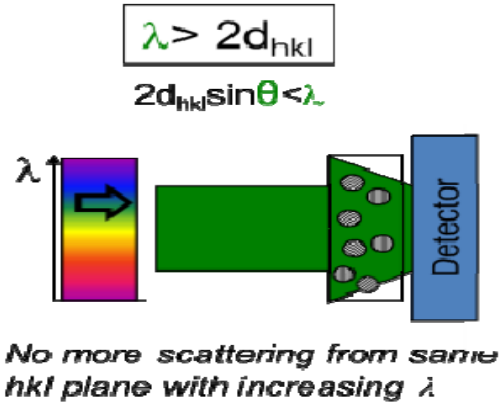


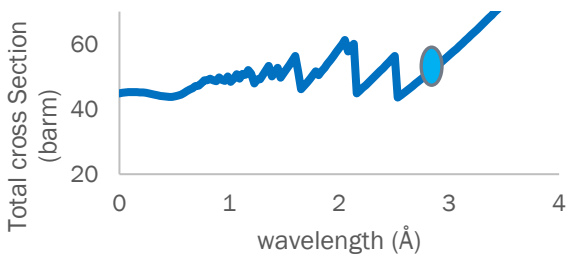


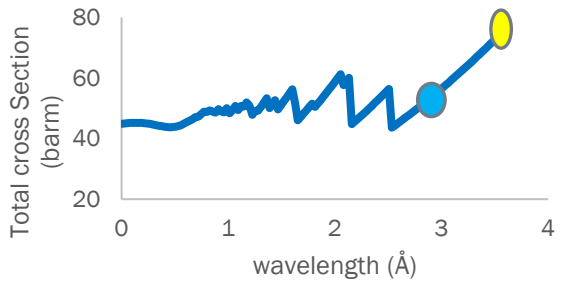


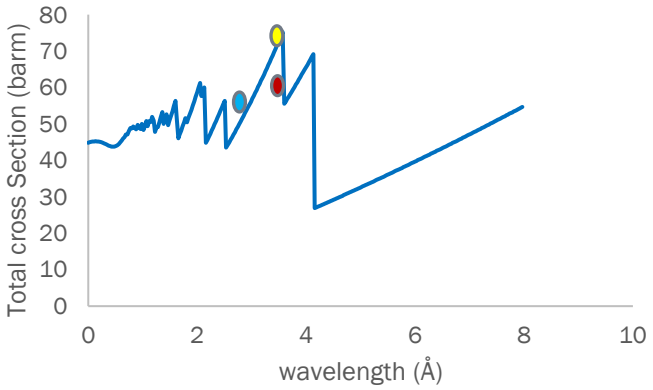




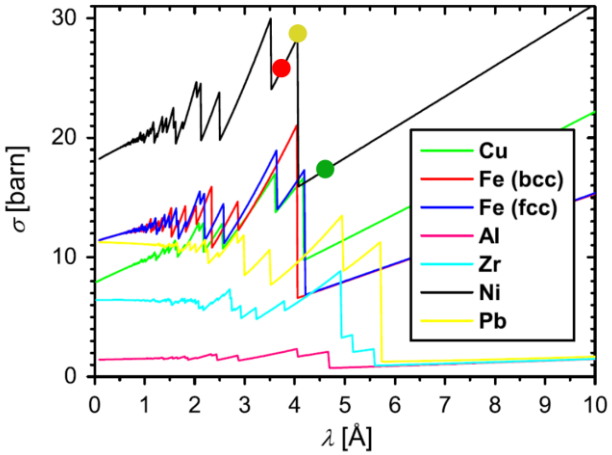






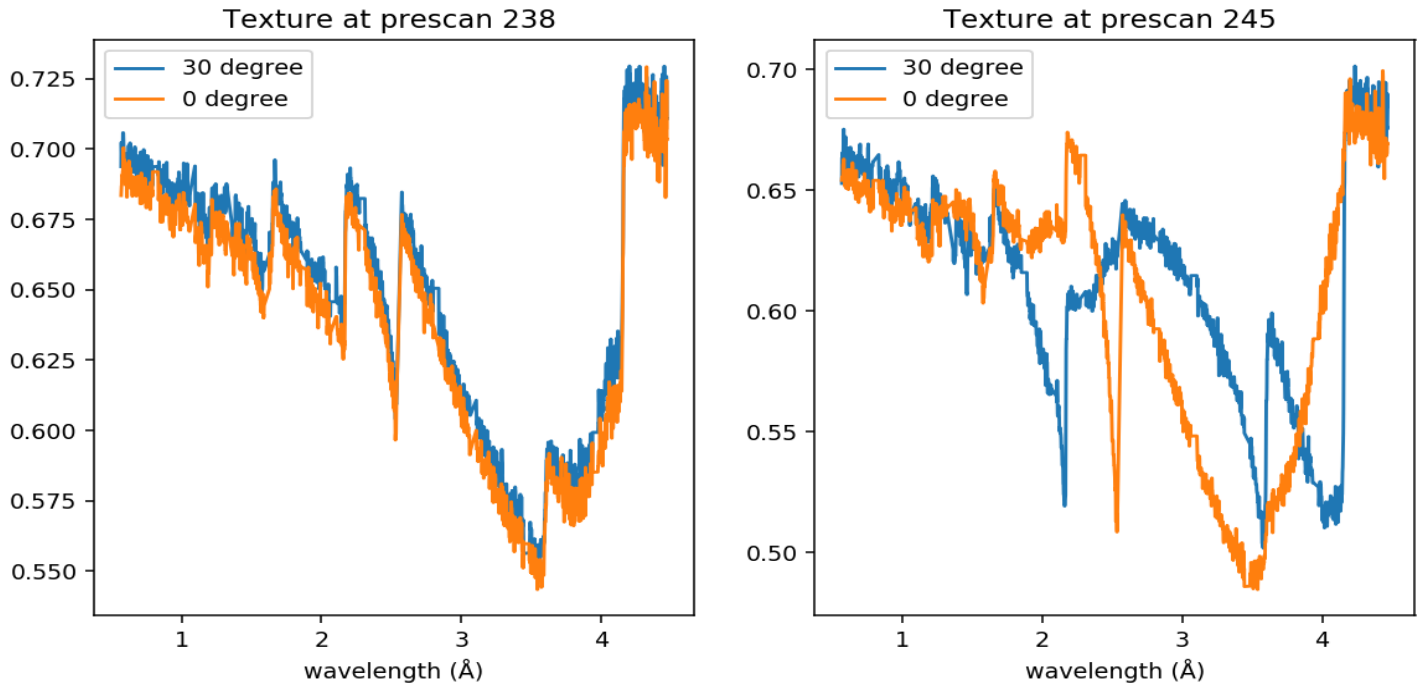


- At certain hkl plane, the scattering angle increases with λ increases (red)
- Till θ



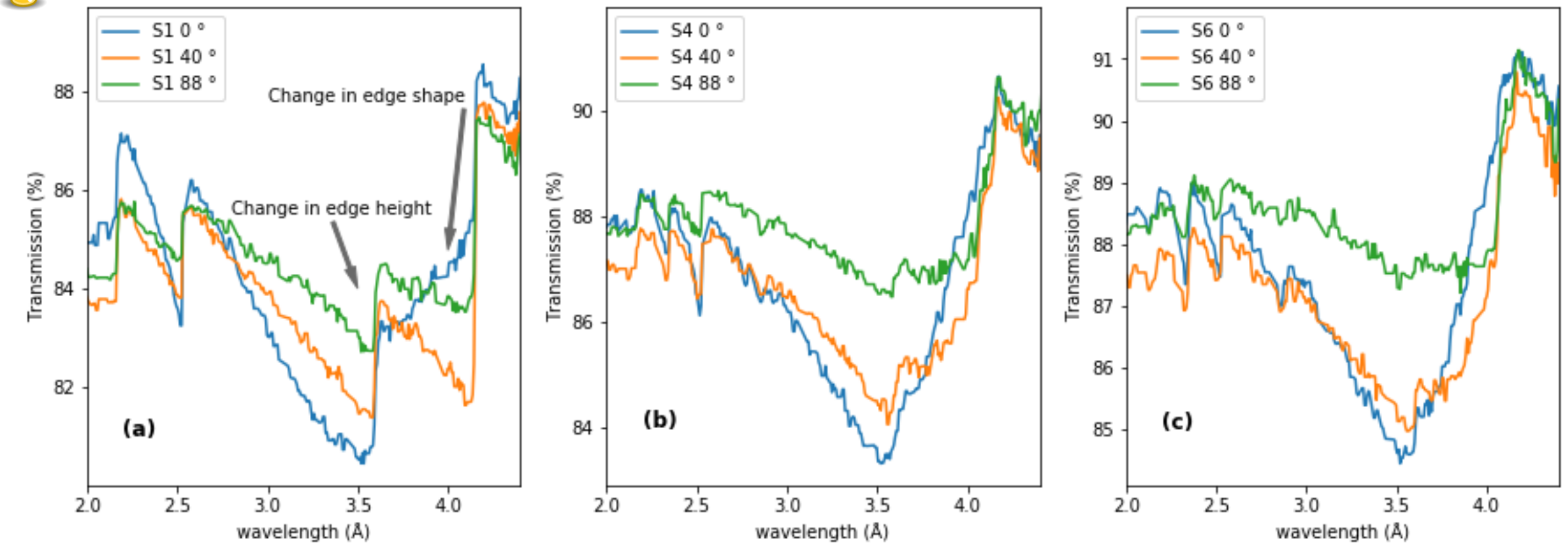
Bragg edge transmission imaging | Textured samples

- **The two angles (0º and 30 º) look similar indicating no textured is observed in this sample**



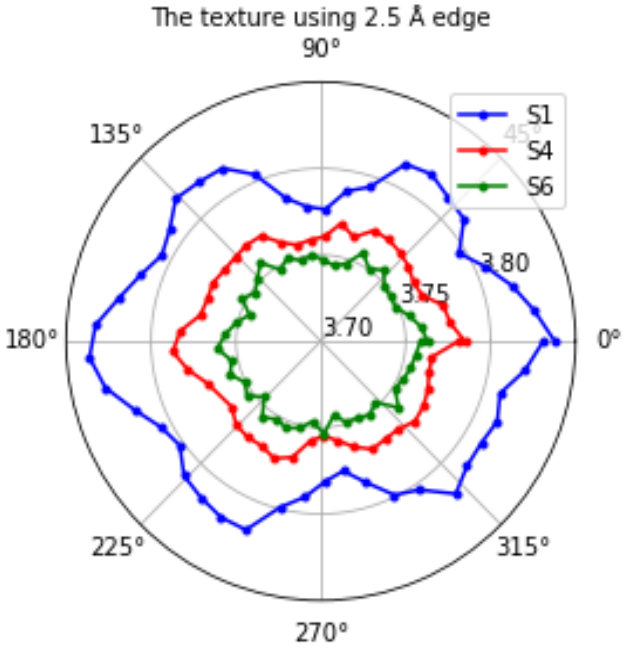
Tomography at two angles show strongly textured structure sample

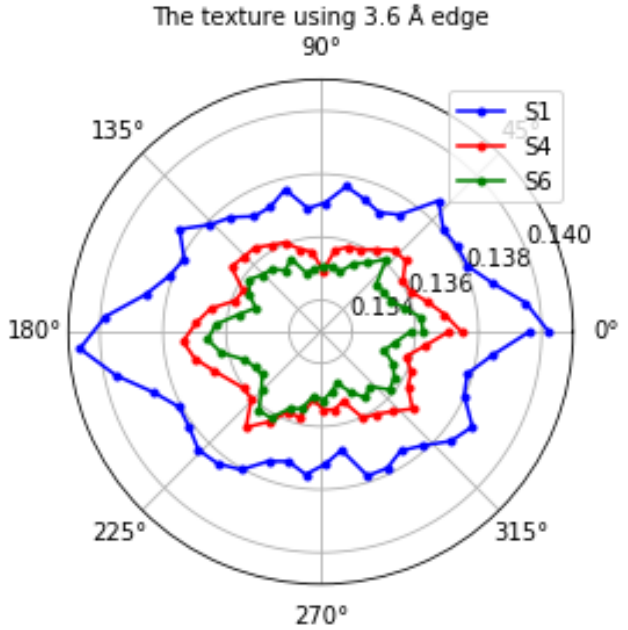
Beamtime	Texture anaylsis

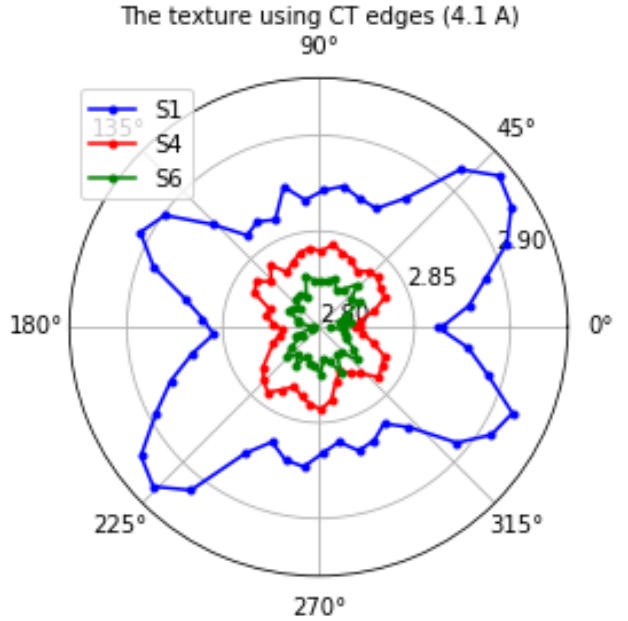


Beamtime	Texture anaylsis

- The texture for the three states at the three Bragg edge positions for austenite phase; (220),(200) and (111)

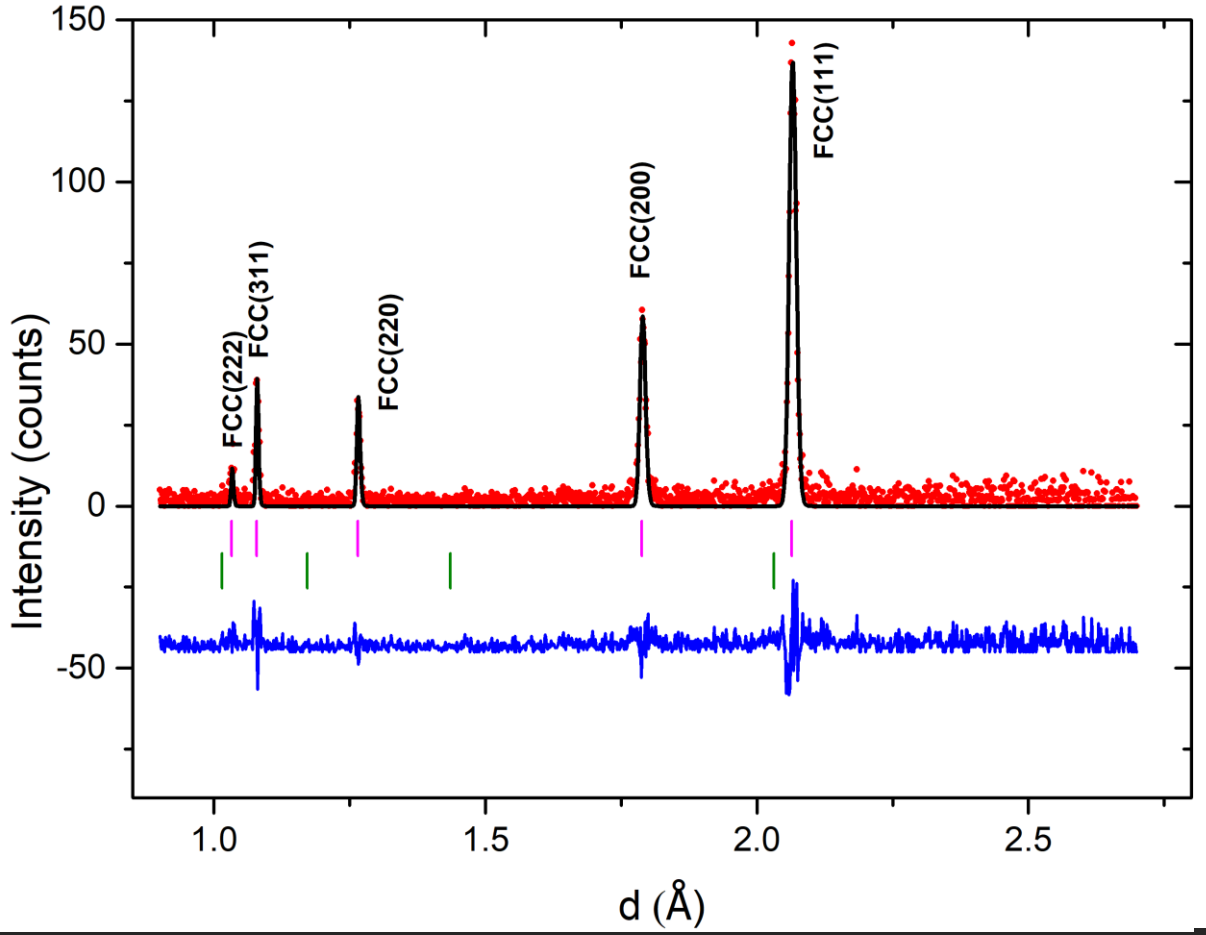




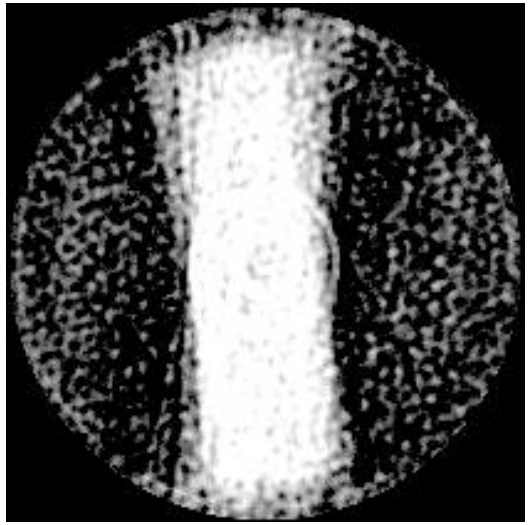


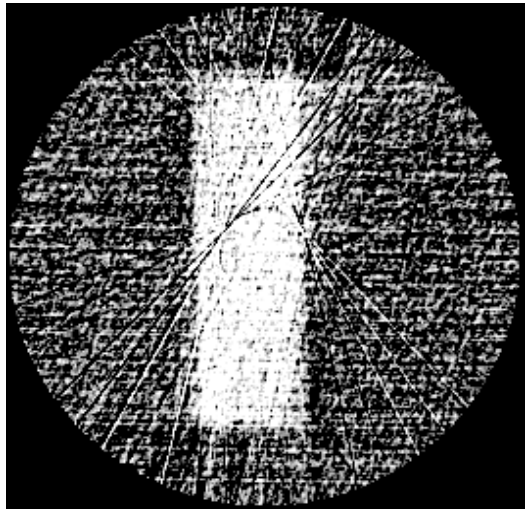
Beamtime | Experimental setup

- Rietveld fitting for diffraction pattern for the virgin state confirms the austenite single phase



Beamtime SENJU	CT reconstruction and angle correction

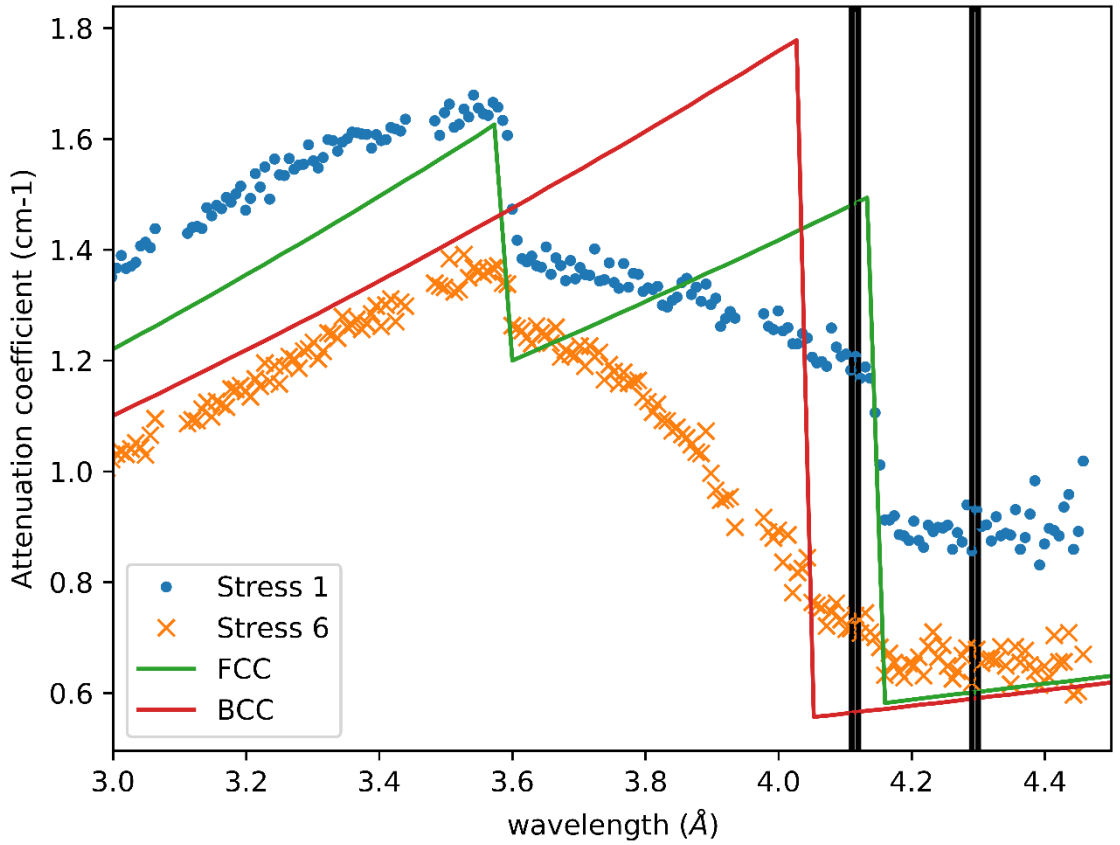




- The idea is to get the phases from the CT reconstruction, however we need to get the best quality CT slices.

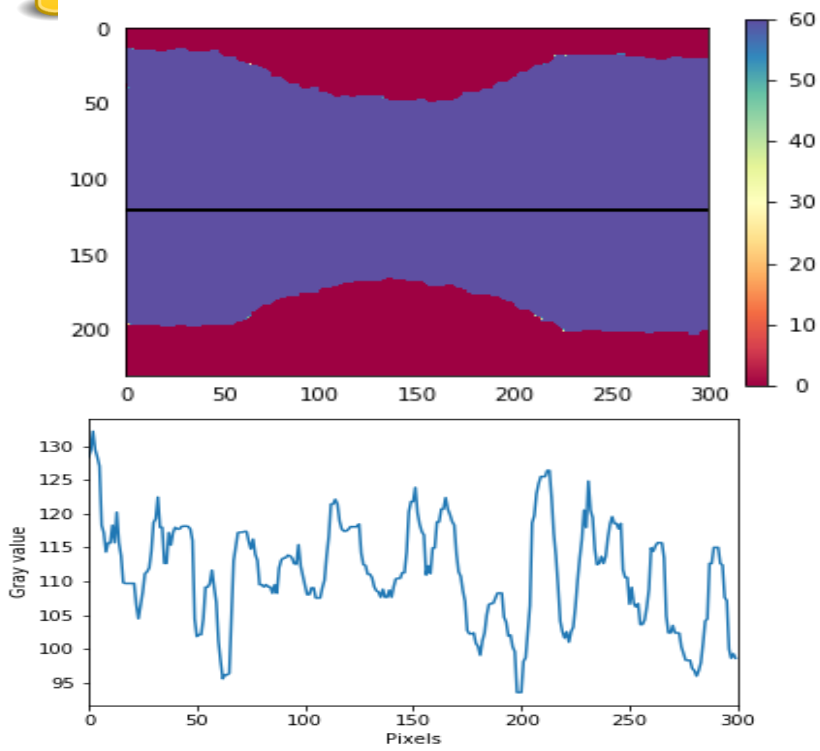
Beamtime SENJU | Wavelength for CT reconstruction

- The idea is to get the phases from the CT reconstruction.
  - Stress 1 was all Austenite FCC and Stress 6 was mixed phase, some Martensite appear
  - I choose to do CT around 4.15 A (Austenite peak)

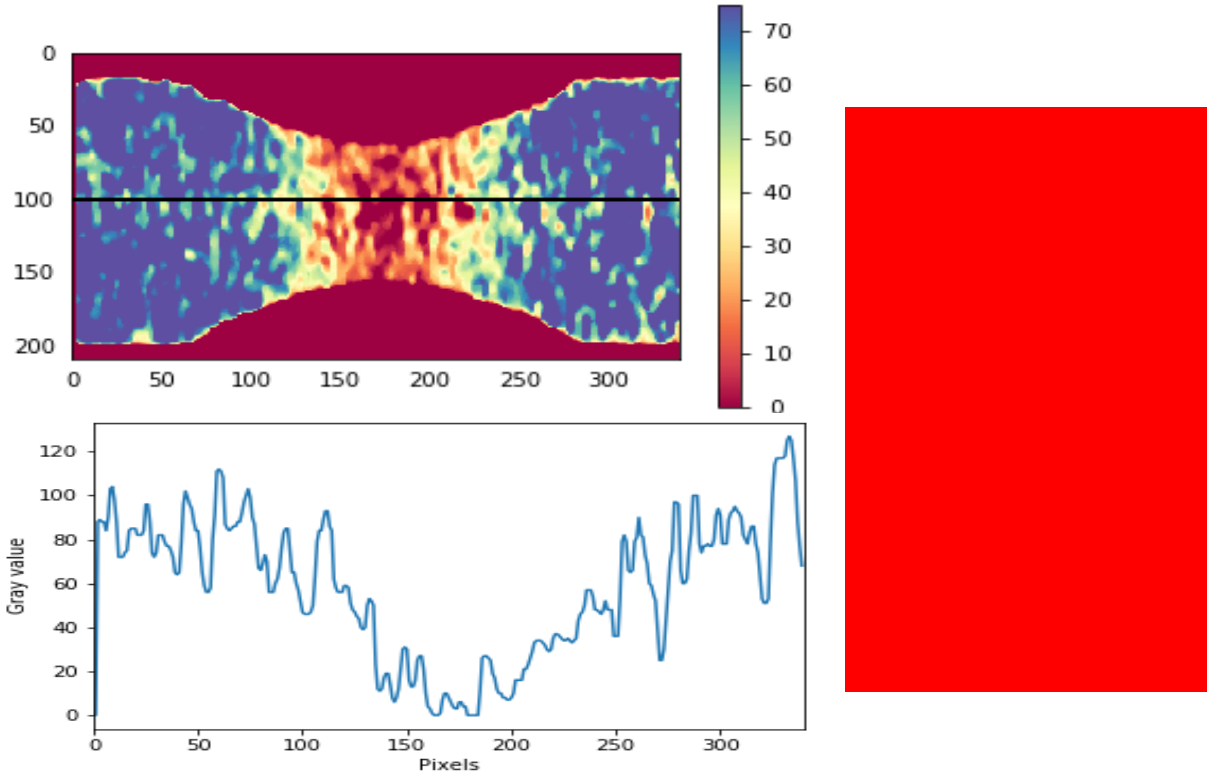


Beamtime SENJU

CT reconstruction

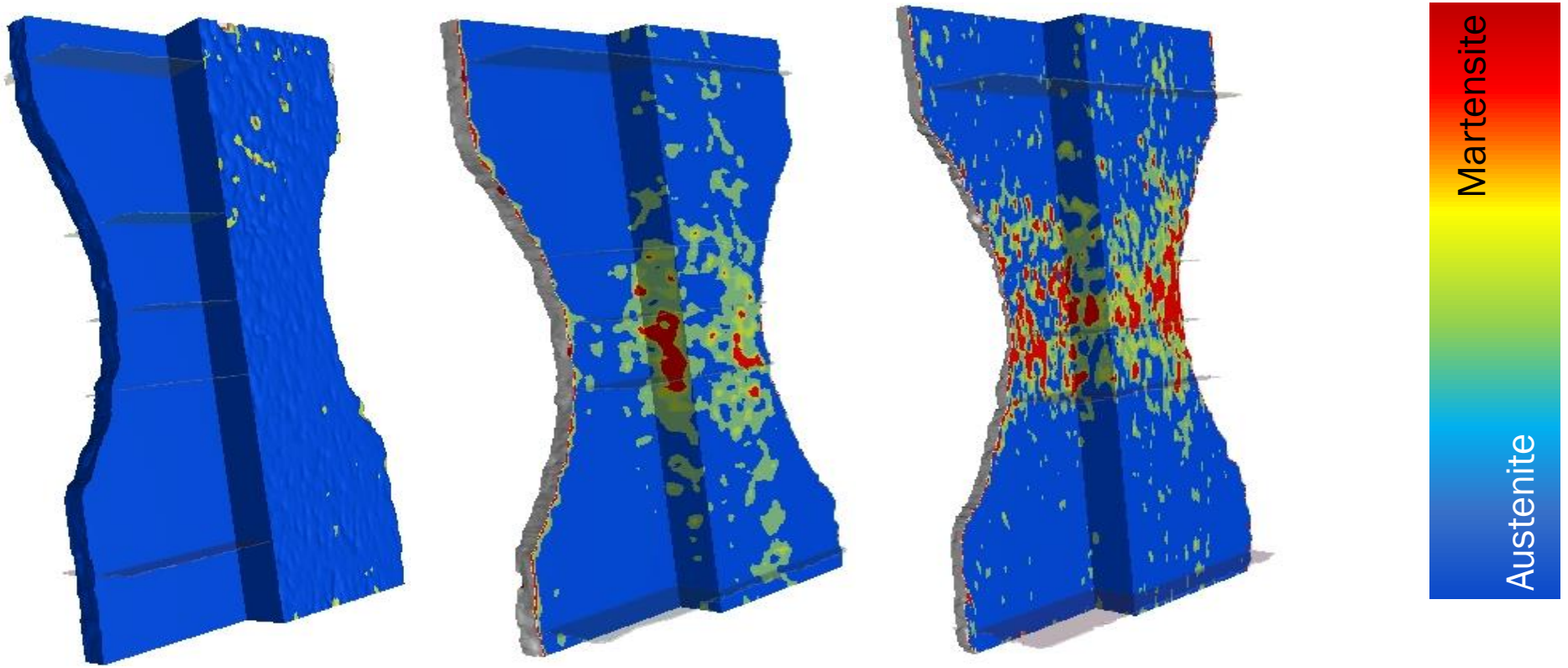


The Intensity is nearly uniform over all the sample



The middle gauge has lower intensity as result of lower percentage of the FCC phase

Beamtime SENJU	CT reconstruction



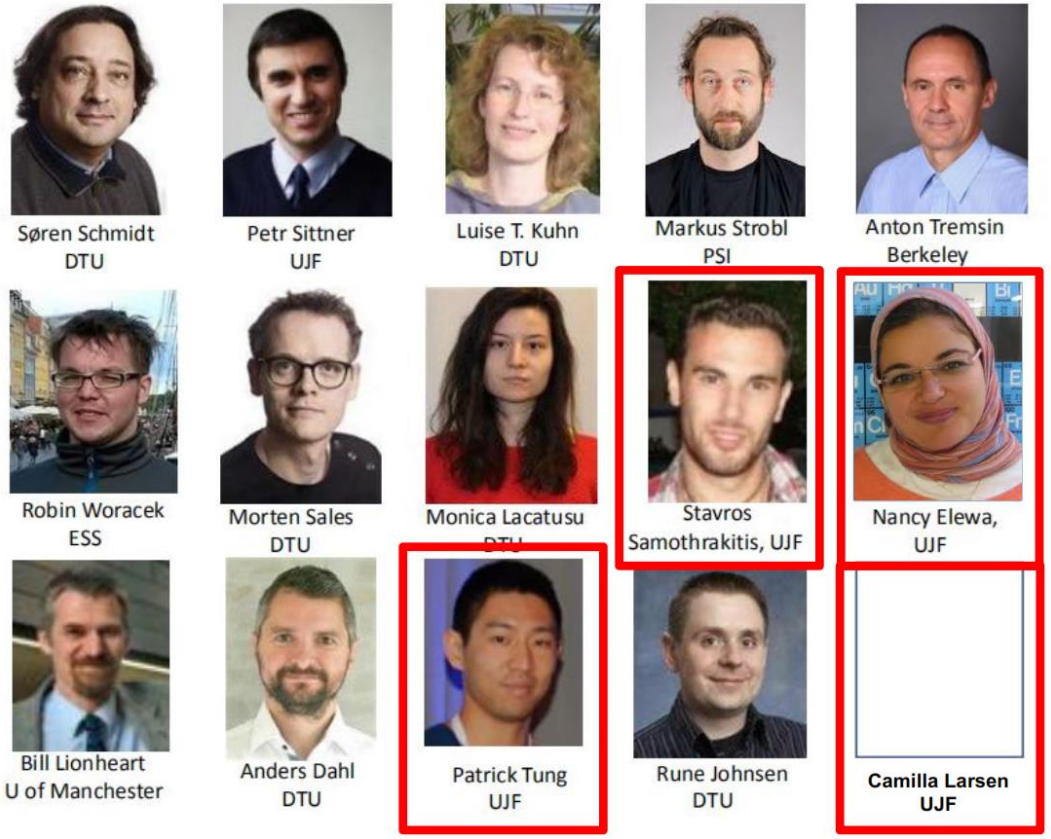
Take home message

X ray diffraction, neutron diffraction and neutron imaging are very powerful tools to study materials and correlate their structure with their properties

Acknowledgements

HZB Helmholtz Zentrum Berlin

FZU Fyzikální ústav Akademie věd České republiky



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ess EUROPEAN SPALLATION SOURCE

Some nice moments 😉

Thanks for your time